

Bouguer gravity map of the southern
San Francisco Bay region, California

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OPEN-FILE REPORT

78-733

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Discussion

This gravity map covers the southern sheet (number 3) of the topographic map of the San Francisco Bay Region and includes the eastern part of the San Francisco, the western part of the San Jose, and the northwestern part of the Santa Cruz 1° x 2° map quadrangles (scale 1:250,000).

Most of the gravity data utilized in compiling this map were previously shown on three sheets of the "Bouguer gravity map of California" (Bishop and Chapman, 1967; Chapman and Bishop, 1968; and Robbins and others, 1977). On the present map the data from Bishop and Chapman (1967) and Chapman and Bishop (1968) have been slightly modified to bring all data to a common datum level and format (Robbins and others, 1974, p. 2-8). New data obtained by the authors, after the above publications were released, are included on this map along with other new data from the following sources: Clark (1970), Cooper (1971), Cronyn (1973), John Fett (written commun., 1975), Holden (1976), Prael and Mills (1971), Seidelman (1975), and Spikes (1973). These data have also been adjusted in various ways to provide mutual consistency. The boundaries for the original data sources are shown on the index figure and are keyed to the list of sources.

The observed gravity values from the various land surveys have been adjusted to a common datum by means of a local network of gravity base stations (Chapman, 1966) which is referenced to a national gravity base station at

San Francisco airport (Behrendt and Woollard, 1961, table 2, station WA 86). Oceanic data are referenced to base stations in San Francisco and Oakland (Lattimore and others, 1968), and in Monterey (Cronyn, 1973, p. 22; Spikes, 1973, p. 33). The land surveys were made with either LaCoste and Romberg or Worden gravity meters calibrated on one or more of the U.S. Geological Survey calibration ranges (Barnes and others, 1969, p. 526-527). The marine surveys include both surface-ship and ocean-bottom data using LaCoste and Romberg meters.

All land data have been reduced to complete Bouguer anomalies for a density of 2.67 g/cm^3 . The terrain corrections were generally made manually to a radius of 2.3 km and extended to 166.7 km using a computer program (Plouff, 1977) and the digital topographic model of California (Robbins and others, 1973). Terrain corrections are the main source of errors in the Bouguer anomalies, the errors being generally less than 0.3 mgal but ranging up to perhaps one mgal in extreme topography such as the top of Mount Hamilton.

The ocean-bottom data near Santa Cruz in the area of 2-mgal interval contouring have been reduced using double Bouguer anomaly corrections: one for the crustal density of 2.67 g/cm^3 and one for the sea water density of 1.03 g/cm^3 (Cronyn, 1973; Spikes, 1973). Terrain corrections were made to a radius of 166.7 km by hand using templates.

The remaining marine data (both surface-ship and ocean-bottom) in the area of 5-mgal interval contouring were reduced to Bouguer anomalies using the difference between 2.67 g/cm^3 and the density of sea water, 1.03 g/cm^3 . No terrain corrections were made for these data.

The values of observed gravity for ocean-bottom and land gravity measurements are believed to have an accuracy of ± 0.05 to ± 0.3 mgal relative to the local base station. Much of the surface-ship data have errors of

± 2 to ± 3 mgal or more. Because of the errors in the surface-ship data, the contouring in the oceanic areas with 5-mgal contouring may locally be in error by one contour interval.

The main improvements of this map over earlier versions (Bishop and Chapman, 1967; Chapman and Bishop, 1968; and Robbins and others, 1977), other than that this map is at a scale of 1:125,000 whereas the previously published maps are at 1:250,000, are: 1) new data in some areas (Livermore Valley, oceanic areas, east side of Santa Clara Valley, and Hollister area), 2) better terrain corrections on the older data, and 3) a 2-mgal contour interval instead of a 5-mgal interval.

A tabulation of the principal facts for the gravity stations and a map showing station numbers and locations are available on request from the Sacramento District office of the California Division of Mines and Geology. Much of the data on the San Jose $1^{\circ} \times 2^{\circ}$ quadrangle can be found in tabular form in Robbins and others (1974).

Discussions of the geologic significance of Bouguer anomalies in various parts of sheet 3 and tabulations of rock densities for certain rock units may be found in the following publications:

Santa Cruz sheet (south of 37°N) - Bishop and Chapman (1967)

San Francisco sheet (west of 122°W) - Chapman and Bishop (1968)

San Jose sheet (east of 122°W) - Robbins and others (1977)

Santa Cruz Mountains and Gabilan Range - Clark and Rietman (1973)

San Mateo - Seidelman (1975)

San Jose area - Robbins (1971)

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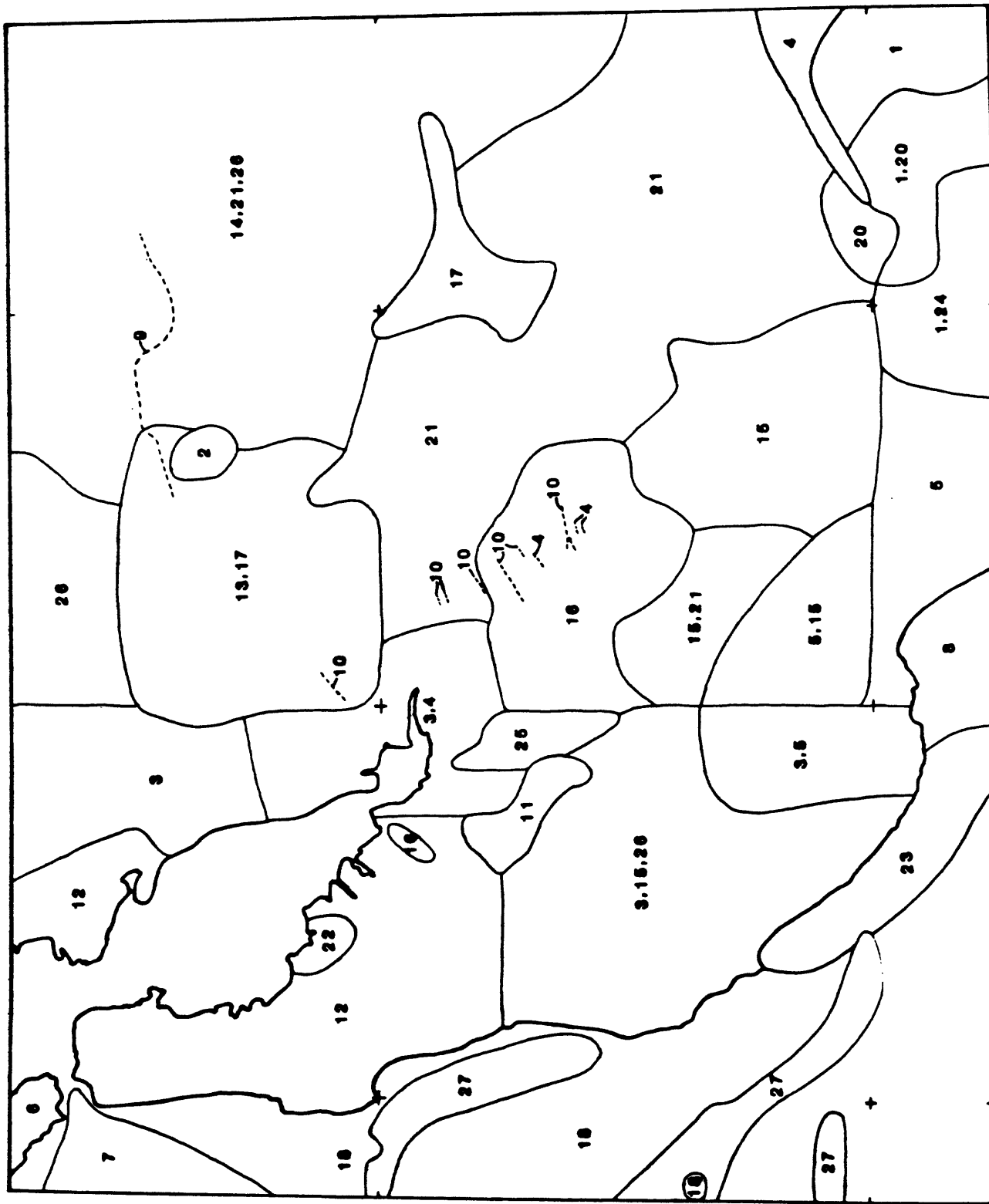
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Source data are available from the California Division of Mines and Geology,
Sacramento, California



GENERALIZED INDEX TO SOURCES OF GRAVITY DATA

EXPLANATION



Gravity field station



Gravity base station



Lines of equal Bouguer anomaly in milligals.

Gravity highs are marked with a "+".

Hachures indicate gravity lows.

2-mgal contour interval is used for all land data and some offshore bottom data west of Santa Cruz for which terrain and curvature corrections have been made to a distance of 166.7 km. Contours are dashed where poorly controlled.

5-mgal contour interval is used and all lines are dashed for offshore surface ship data and some offshore bottom data for which no terrain or curvature corrections have been made.

Reduction density: 2.67 g/cm^3 . Gravity datum is the California base network (Chapman, 1966).